REMARKS

Applicants appreciate the Examiner's thorough consideration provided the present application. Claims 1, 2, 4-6 and 8 are now present in the application. Claims 1 and 5 have been amended. Claims 3 and 7 have been cancelled. Claims 1 and 5 are independent. Reconsideration of this application, as amended, is respectfully requested.

Claim Rejections Under 35 U.S.C. § 103

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee, "Fast head modeling for animation", in view of Migdal, U.S. Patent No. 6,208,347. This rejection is respectfully traversed.

Independent claim 1 recites "(a)inputting original 3D model data; (b) building 3D feature-lines according to the original 3D model data; converting the 3D feature-lines into 3D threads, wherein the 3D threads are composed of connection joints, connection lines, and loops, wherein the connection joints are intersection points of the 3D feature-lines, the connection lines are the 3D feature-lines between two connection joints, and the loops are closed zones constructed by the connection lines; (d) determining sample numbers of each connection line, adding or deleting the loops, and outputting the 3D threads; (e) producing a regular triangular grid sample model according to the 3D threads; (f) projecting the regular triangular grid sample model into the original 3D model to produce a reconstructed 3D model; and (g) redetermining sample numbers for each connection line, readding or redeleting the loops, and repeating steps (e) and (f) if the reconstructed 3D model does not satisfy resolution requirements, and outputting

the reconstructed 3D model if the reconstructed 3D model satisfies the resolution requirements, wherein the reconstructed 3D model is located on the 3D feature-lines despite of the sample numbers."

Independent claim 5 recites "inputting original 3D model data; building 3D feature-lines according to the original 3D model data; converting the 3D feature-lines into 3D threads, wherein the 3D threads are composed of connection joints, connection lines, and loops, wherein the connection joints are intersection points of the 3D feature-lines, the connection lines are the 3D feature-lines between two connection joints, and the loops are closed zones constructed by the connection lines; determining sample number of each connection line, adding or deleting the loops, and outputting the 3D threads; producing a regular triangular grid sample model according to the 3D threads; projecting the regular triangular grid sample model into the original 3D model to produce a reconstructed 3D model; and outputting the reconstructed 3D model, wherein the reconstructed 3D model is located on the 3D feature-lines despite of the sample numbers."

Applicants respectfully submit that the above combinations of steps as set forth in independent claims 1 and 5 are not disclosed nor suggested by the references relied on by the Examiner.

According to claims 1 and 5, original 3D model data is provided, 3D feature-lines are built according to the original 3D model data, the 3D feature-lines are converted into 3D threads, wherein the 3D threads are composed of connection joints, connection lines, and loops, wherein the connection joints are intersection points of the 3D feature-lines, the connection lines are the 3D feature-lines between two connection joints, and the loops are closed zones constructed by

the connection lines. A reconstructed 3D model is generated from the 3D threads according to determined sample numbers for each connection line by performing steps (e) and (f) of claim 1 and the corresponding steps of claim 5. According to claim 1 and 5, different reconstructed 3D models can be generated using different sample numbers (claim 1, steps (g), (e), and (f)). The reconstructed 3D model is determined according to the sample numbers, which are set for (sample points on) the connection lines. Accordingly, different reconstructed 3D models share the same connection lines.

In addition, as recited in claims 1 and 5, the 3D feature-lines are converted into 3D threads, wherein the 3D threads are composed of connection joints, connection lines, and loops, wherein the connection joints are intersection points of the 3D feature-lines, the connection lines are the 3D feature-lines between two connection joints, and the loops are closed zones constructed by the connection lines. The components of the 3D threads (*i.e.*, the connection joints, connection lines, and loops) are formed by part of the 3D feature-lines. Accordingly, the 3D threads are located on the 3D feature-lines. A reconstructed 3D model is constructed by changing sample numbers on the connection lines and adding/deleting the loops in the 3D threads. Accordingly, the reconstructed 3D model is located on the 3D feature-lines despite of the sample numbers.

Lee teaches a method to make individual faces for animation from several possible inputs. Lee discloses a method to reconstruct 3D facial model for animation from two orthogonal pictures taken from front and side views or from range data obtained from any available resources. It is based on extracting features on a face in a semiautomatic way and modifying a

generic model with detected feature points. Then the fine modifications follow if range data is available. Automatic texture mapping is employed using a composed image from the two images. The reconstructed 3D-face can be animated immediately with given expression parameters. According to Lee, several faces by one methodology are applied to different input data to get a final animatable face.

Lee provides a 3D generic model with animation structure in and 2D frames used for the normalization and the feature detection (section 2.1). Lee applies feature detection from 2D image data (orthogonal picture images or texture image for range data), and then modifies the given generic model for a rough matching. The generic model is utilized in normalization and feature detection for different feature detection subjects. In addition, before the matching procedure, the given generic model is distinct from the feature detection subject.

On the contrary, in claims 1 and 5, the 3D feature-lines, 3D threads, as well as the reconstructed 3D model, reside in the same grid model surface. In addition, Lee fails to teach or suggest the reconstruction of a regular 3D model from an original 3D model of claim 1. The method taught by Lee is completely different from claim 1.

Migdal discloses a system and method for modeling 3D objects and 2D images by wireframe mesh constructions having data points that combine both spatial data and surface information such as color or texture data. The use of the complex data points (e.g., X, Y, Z, R, G, B in 3D and x, y, R, G, B in 2D) allows the modeling system to incorporate both the spatial features of the object or image as well as its color or other surface features into the wireframe mesh. The 3D object models taught by Migdal do not require a separate texture map file for

generating display or other object manipulations. In the exemplary embodiment, the mesh constructions taught by Migdal contain sufficient color information such that the triangles of the meshes can be rendered by any processor supporting linear or bilinear interpolation such as Gouraud shading. For 2D systems, the 2D mesh models created from the teachings of Migdal replace bitmap files and present a greater level of data compression and flexibility in image manipulation than is currently available in compression systems such as JPEG. In addition, the modeling system taught by Migdal has dynamic resolution capability, such that surface details like color or texture can be rapidly added or subtracted from the model.

As mentioned, Migdal provides a system and method for modeling 3D objects and 2D images by wireframe mesh constructions having data points that combine both spatial data and surface information such as color or texture data. The mesh construction taught by Migdal has nothing to do with the feature lines.

On the contrary, in claims 1 and 5, the reconstruction of a regular 3D model is built from feature-lines in an original 3D model. In addition, different reconstructed 3D models share the same connection lines despite of resolution changes. This feature is advantageous, for various applications utilize position information of the reconstructed 3D model for further editing and/or setting control points. Migdal nowhere teaches or suggests a locked-position reconstructed 3D model, and does not provide the described benefits of the claimed invention. Migdal fails to teach or suggest the reconstruction of a regular 3D model from an original 3D model of claims 1 and 5. The method taught by Migdal is completely different from claims 1 and 5.

Referring to color versions of Figs. 2-7B of the present invention, the feature lines segmentation can be recognized easily. Using Figs. 6A and 7A as examples, users can enhance partial resolution of the reconstructed model through an interface to meet requirements. Figs. 7A and 7B are reconstructed 3D models with partially enhanced resolution according to the invention. The feature lines (presented as blue lines) of Figs. 6A and 7A are the same, while sample numbers (presented as nodes on the blue lines) are increased in the feature lines of Fig. 7A. A reconstructed 3D model is constructed based on nodes based on the re-determined sample number. The present invention provides a method of adjusting resolution of the reconstructed 3D model without changing the original feature lines. The technical feature facilitates further applications, such as 3D animation, and is clearly absent from the utilized references.

Accordingly, neither of the references utilized by the Examiner individually or in combination teaches or suggests the limitations of independent claims 1 and 5 or their dependent claims. Therefore, Applicants respectfully submit that claims 1 and 5 and their dependent claims clearly define over the teachings of the references relied on by the Examiner.

Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103 are respectfully requested.

CONCLUSION

It is believed that a full and complete response has been made to the Office Action, and that as such, the Examiner is respectfully requested to send the application to Issue.

In the event there are any matters remaining in this application, the Examiner is invited to contact Joe McKinney Muncy, Registration No. 32,334 at (703) 205-8000 in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Dated: October 31, 2007

Respectfully submitted,

By ____________________
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